Physical stress and physical exercise dependence

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ABSTRACT

The aim of this study was to verify the referring scores of exercise dependence, quality of life as well as the mood indicators in adventure race (AR) athletes. 17 athletes of both sexes participated in the study and all had a history of three years in this modality, with national and international experience, and figured in the first positions in the Brazilian ranking. The age, height, weight, body mass index (BMI) and oxygen uptake averages ± standard deviations were: 31.11 ± 6.30 years; 1.73 ± 0.07 cm; 70.75 ± 7.96 kg; 23.48 ± 1.48 wt/ht^2 and 58.70 ± 6.63 ml.min^{-1}.kg^{-1}, respectively. The volunteers were given the following questionnaires: Exercise Dependency Scale (EDE), Idate Trait and State, Profile of Mood States (POMS), SF-36 Health Research and Social Patterns Questionnaire. The results showed that scores in EDE indicated exercise dependence, and the mood questionnaires revealed moderate anxiety, while the POMS did not detect any indicative scores of mood disorders. Concerning the quality of life, the average of 8 dimensions of the SF-36 was higher than 85%, suggesting that although there was exercise dependence, this fact alone did not promote significant alterations in mood and quality of life. Thus, our data suggested that athletes of AR have exercise dependence not associated to mood disorders.

Keywords: Athletes. Adventure race. Exercise dependency. Mood.

INTRODUCTION

Adventure Racing (AR) is a multisport in which athletes who participate are grouped in teams of both sexes, with the purpose to complete a given distance in different sport kinds in the shortest time, demanding the maximum of their physical and mental abilities. In this competition, the athletes are guided through compass, altimeter and topographic maps, for uninterrupted days and nights, in regions little explored, being banned the use of GPS (*Global Position System*)[1].

The most well-known ARs are the *expedition races* (1 to 10 days) and the *sprint races* (3 to 24 hours). A co-ed team of four athletes is the standard formation for several of these races, usually consisting of at least an individual of the opposite sex. The *sprint races* offer a wide variability of categories including male, female and co-ed pairs, besides trios and quartets. Recently, the solo category has been introduced[2-4].

During an AR, the athletes carry backpacks which contain besides mandatory equipment (first-aid kit, heating blanket, whistle, headlamp, mandatory security gear and vertical techniques, etc.), food and fluids that can be water, carbohydrated drinks or similar ones. The mandatory gear may vary according to the kind to be developed, and usually, a backpack weight varies between 3 and 10 kilos due to the number of transitions during the race and the distance to be completed. In short races the weight is lighter[2-4].

There is a hierarchy in the teams which is reflected in the existence of a captain, a navigator and remaining members. The captain is in charge of taking all the decisions about the strategy adopted for the race, as well as of answering in the name of the team in front of the race organization. Another element equally important is the navigator. He/she is in charge of determining the way to be covered by the team using the allowed orientation equipment. Usually, the navigator is not only required to have a good physical conditioning but a large cognitive component as well, since any map misreading may harm the team and cause it to get lost, which means additional physical and mental effort until the correct way is reached. Strategy and navigation are the main points of the race. The other team members have the duty to take care of and keep the equipment and take care and/or take over the navigator's and captain's tasks whenever they are not able to fulfill them.

The sports types practiced in this kind of competition vary according to its place, but the majority of the ARs have the following types: navigation or orientation, trekking, mountain bike, swimming, canoeing (in several boats, on rough waters and still waters as well) and vertical techniques. The team members should remain together during the entire race; moreover, the way to be covered is only known the day before the exit when the athletes receive the topographic map of the region and the race book with the geographic coordinations of each mandatory stop between the exit and arrival. These stops are called control station (CS) and/or transition area (TA). The complete team that first crosses the arrival line and has passed by all the CS and/or TA is declared the winner. The not fulfillment of the competition rules implies in penalties and even elimination[2-4].

AR is a race fairly demanding that associates not only a good physical conditioning but also a large cognitive component and the ability to work and remain in a group. Moreover, during the entire race, the athletes are submitted to several situations that vary from environmental alterations (heat, cold), sleep deprivation, tiredness and fatigue, even reduction in the dietetic and water intake. The athletes sleep the least they can with the aim to complete the race the fastest as possible, although they can rest whenever they consider necessary.

An example of physical stress to which these athletes are subjected, refers to the occurrence of lesions. The study by Townes *et al.* (2004)[1] conducted during the *Subaru Primal Quest Expedition Adventure Race* in Colorado (EUA, 2002), showed that 59% of the medical help occurred due to lesions and 41% to disease. Skin dilacerations and feet lesions were the main cause for medical assistance, followed by respiratory diseases. Within this context, Fordham *et al.* (2004)[5] when conducting an epidemiological study about the athletes' lesions backdated to a 18-month period, defined lesion as any musculoskeletal problem which caused training interruption for at least one day and reduction of training volume in the subsequent sessions and need of medications ingestion

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and/or medical assistance. 73% of the 300 evaluated athletes reported lesions, being the most common: ankle (23%), knee (30%), tibia, lumbar and calcaneal tendon ones (12% each). According to the authors, the incidence of lesions is due to the nature of the different terrains on which the athletes train and compete and the inadequate resting period between training and competitions. Moreover, the athletes are exposed to agents which cause unusual diseases such as Leptospirosis[6] and *Rickettsia africae*[7].

An interesting fact on these ARs is that even under several environmental adversities and minimum hygiene conditions; food and sleep deprivation; excessive physical and metabolic breakdowns; the athletes seem not to worry about this situation and frequently complete a race already planning for the next one. Such behavior suggests a remarkable questioning: are these athletes physical exercise-dependent? Does this physical stress make them dependent?

According to DeCoverley Veale (1987)[8] dependence may be characterized as following: a) repertoire narrowing, leading to an exercise stereotyped pattern one or two times during the day; b) behavior salience in exercise practice, giving it priority over other activities so that the exercise patterns are kept; c) increase in the tolerance to exercise quantity and frequency as the years pass by; d) abstinence symptoms related to mood disturbs (irritability, depression, anxiety, etc.) when the exercises practice is interrupted; e) relief or prevention of the abstinence syndrome occurrence through more exercises practice; f) subjective conscience of the exercise practice compulsion and g) fast reinstallation of previous exercises patterns and abstinence symptoms after a period without physical exercises. According to the same author, other characteristics are or may be associated with exercise dependence such as: 1) the individual continues the exercises practice, even when is sick, injured or with any other medical condition or when the exercises practice negatively interferes in the relationship with a partner, family, friends or at work; 2) the individual is on a diet in order to lose body weight as a means of improving the performance. Whenever not able to exercise, symptoms such as irritability, anxiety, depression and guilt feelings seem to be constant in subjects exercise-dependent[9].

Thus, taking into consideration that AR in Brazil is a new sport that exists for less than 10 years, that involves such diversity and that there is not information about the exercise dependence in this sport, the aim of the present study was to verify the scores related to the exercise-dependence scale, as well as the scores pointing to mood and life quality in AR athletes.

METHODOLOGY

All the procedures were previously approved by the Ethics Committee of the Federal University of São Paulo (# 0749/04). The nature of the study and its aims were carefully explained for all the volunteers who later signed a free and clarified consent form.

17 AR athletes of both sexes, with history of the sport practice for at least three years, with experience in national and international competitions and who appear in the first positions in the Brazilian ranking participated in this study. The average (± standard deviation) of age, height, body weight, body mass index (BMI) and oxygen consumption were: 31,11 ± 6,30 years; 1,73 ± 0,07 cm; 70,75 ± 7,96 Kg; 23,48 ± 1,48 kg/m^2 and 58,70 ± 6,63 ml.min^{-1}.Kg^{-1}, respectively.

The questionnaires of exercise dependence, mood, life quality and social status were applied. The application was individually conducted in a resting day of the athletes (when there was no physical exercises practice), and the application order was planned with the purpose not to interfere in the volunteers' answers. The procedures were previously explained to the volunteers and they were asked to honestly answer the questionnaires, being total discretion of their answers guaranteed.

Questionnaires (presented in the application order):

1) EXERCISE-DEPENDENCE SCALE (EDS) – Instrument for measuring the exercise dependence, based on the original *Negative Addiction Scale*[10], translated and validated by Rosa *et al.* (2003)[11]. The instrument evaluates the "negative" psychological aspects of the dependence through a 14-item scale, giving each item a score (0 or 1). High scores are related to higher dependence indices.

2) IDATE – It is a self-evaluation questionnaire divided in two parts: one evaluates the anxiety-trait (referring to personality aspects) and a second evaluates the anxiety-state (referring to systemic aspects of the context). Each of these parts consists of 20 sentences. When answering the questionnaire, the individual should take into consideration a scale of four items that varies from 1 to 4, STATE meaning how the subject feels at the "moment" and TRAIT how he/she "usually feels". The score of each part varies from 20 to 80 points and the scores may indicate a low anxiety degree (0-30), a medium anxiety degree (31-49) and a high anxiety degree (higher or equal to 50)[12-14].

3) *PROFILE OF MOOD STATES* (POMS)* – It consists of a list with 65 adjectives related to mood, in which the subject should take note how he/she feels in relation to each adjective, considering a scale from 0 to 4. Six mood factors or affection states are measured through this instrument: tension-anxiety, depression-apathy, anger-hostility, vigor-activity, fatigue-inertia and mental confusion-perplexity[15].

4) SF-36- HEALTH RESEARCH – General questionnaire of life quality evaluation "*Medical Outcomes Study SF-36*", translated and validated for Brazilian population[16]. This questionnaire has the aim to generally evaluate life quality due to its easy administration and comprehension besides being concise. It is a multidimensional instrument consisted of 36 items which evaluate in 8 dimensions distributed as following: 10 items related with functional ability; 4 items of physical aspects; 2 items about pain; 5 items related with the general health state; 4 items about vitality; 2 items related with social aspects; 3 items about emotional aspects; 5 items related with mental health and one other question of comparative evaluation between the current and one year ago health conditions. A score for each of the questions is determined in order to evaluate the results, which are later changed into a scale from 0 to 100, in which "0" corresponds to worse health state and "100" to a better state. Each of the dimensions is separately analyzed[16].

5) QUESTIONNAIRE OF SOCIAL PATTERN – Questionnaire that determines the social classification of the individuals[17].

Statistical analysis

The tool of relative frequency distribution was used for data description, and the Student t-test for independent samples was used for comparison between the EDS scores between the genders. Since the data observed in the EDS did not follow a normality pattern, the correlation between the final score and each item of the questionnaire used the correlation coefficient by Spearman. The data are presented in average ± standard deviation and in percentage.

RESULTS

The socio-demographic characteristics and the characteristics related with sports practice by the sample (week frequency and time dedicated to the sports practice) are presented in table 1. The majority of the athletes presented high educational level belong to the "A" socio-economic class, work and have weekly physical training that totalizes between 10 and 15 hours during 6 days.

* The POMS validation can be found in the thesis by Marco Aurélio Monteiro Peluso "Mood changes associated with intense physical activity", advised by Dr. Laura Helena Silveira Guerra de Andrade at São Paulo University in 2003.

TABLE 1
Sample characteristics according to socio-demographic distribution and to sports practice characteristics

	Men (n = 11)	Women (n = 6)	Total (n = 17)
Marital status (%)			
Married	45,45	50,0	47,05
Co-inhabitant	45,45	33,33	11,74
Single	9,09	16,66	41,17
Education (%)			
Incomplete undergraduate	9,09	33,33	17,64
Complete undergraduate	54,54	33,33	47,05
Graduate	36,36	33,33	35,29
Social class (%)			
A	54,54	66,66	58,82
B	36,36	16,66	29,41
C	9,09	16,66	11,76
Occupation (%)			
Works	90,0	50,0	76,47
Studies	0	0	0
Only practices	10,0	50,0	23,52
Weekly training hours (%)			
< or = 10	18,18	16,66	17,64
> 10 and < 15	72,72	66,66	70,58
> 15	9,09	16,66	11,76
Weekly training days (%)			
5	18,18	16,66	17,64
6	81,81	50,0	70,58
7	0	33,33	11,76

The POMS (*Profile of Mood States*) data are presented in figure 1. The average of the T Scores of both genders, analyzed as a group, demonstrated a profile known as *Iceberg*, shown by the increase of the vigor dimension in relation to the other dimensions. When the genders were separately analyzed, no significant differences were observed, demonstrating hence, that there are not differences between the sexes concerning the presence or not of this profile.

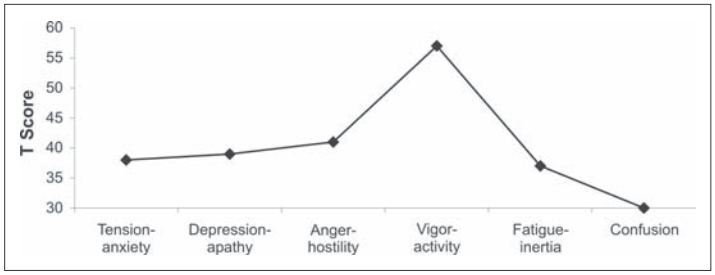

Figure 1 – *Scores related to the observed dimensions in the POMS questionnaire-Profile of Mood States*

The results related to the scores that indicate anxiety trait and anxiety state obtained with the IDATE questionnaire application for both genders are presented in figure 2. The scores observed for anxiety trait and anxiety state were 33,58 ± 6,15 and 40,11 ± 8,90, respectively, being then classified as moderate anxiety for both measurements. Significant differences were not observed when the analyses were performed to compare genders.

The Exercise Dependence Scale (EDS) revealed an average punctuation by the sample total of 5,52 ± 2,40 (average ± standard deviation). The T test for independent samples did not reveal significant differences when the genders were compared. The punctuation obtained by the women was 5,66 ± 2,65 and by the men 5,45 ± 2,38 as shown in figure 3.

The data presented in table 2 show the significant correlations between the total punctuation of the EDS and its questions. The data revealed that 6 questions showed significant correlation indices, being the most expressive questions: "My interest in having fun in other social activities has decreased since I started practicing adventure racing" (r = 0,69); "I experience a high level of pleasure in the majority of my running sessions (r = 0,70) and "Adventure racing has influenced my lifestyle" (r = 0,71). The remaining questions did not reveal significant correlations.

The results related with life quality in its 8 dimensions according to the sample total (both genders) are demonstrated in figure 4.

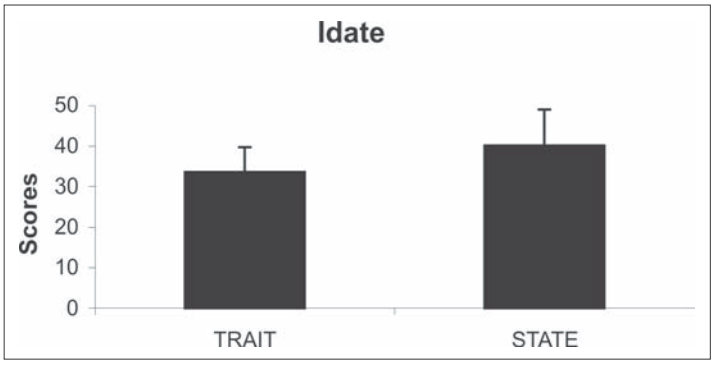

Figure 2 – *Scores related to Trait Anxiety and State, according to the IDATE questionnaire*

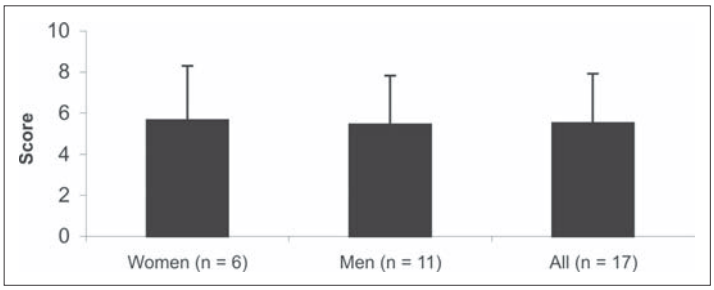

Figure 3 – *Sores related to the Exercise Dependence Scale (EDS)*

TABLE 2
Correlations indices (r by Spearman) between the total punctuation in the EDS and each question. The questions not presented did not reach correlation indices statistically significant

	Questions	R	p
3)	My interest in having fun in other activities has decreased since I started practiced adventure racing.	0,69	0,009
7)	Adventure racing is my main recreational activity.	0,54	0,02
8)	I experience a high level of pleasure in the majority of my running sessions.	0,70	0,001
9)	Adventure racing is a recurrent topic in my conversations.	0,61	0,009
11)	Adventure racing has influenced my lifestyle.	0,71	0,001
13B)	I am usually disciplined and run even on the days in which I am not really in the mood for running.	0,53	0,02

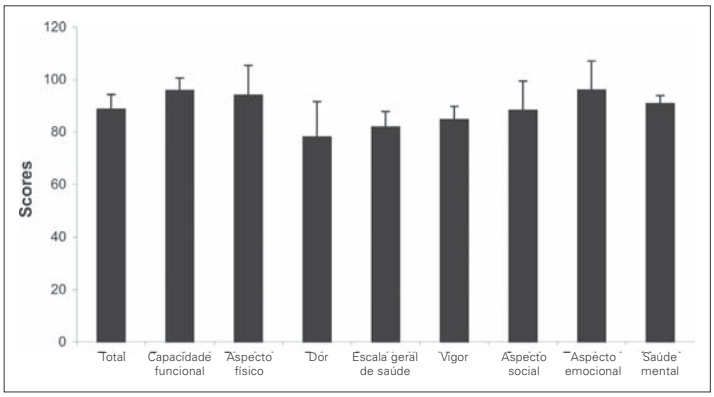

Figure 4 – *Scores related to life quality according to the SF-36 questionnaire – Health Research*

Significant differences were not observed when the dimensions score between genders was compared. The average of the 8 dimensions that reflects the life quality score was 88,73%.

Limiting factors in the study

The data obtained may be better studied and/or observed in case a higher number of volunteers (sample) are possible to be obtained and they are engaged in the entire evaluation process. Thus, further studies using a higher sample should be conducted.

DISCUSSION

Several studies have demonstrated through the years that the acute and/or chronic physical exercise practice produces positive results in the physical and cognitive aspects, increasing the life quality of the practitioner[18]. However, in some individuals this practice may lead to an obsession-compulsion feeling, known as exercise dependence[19-20].

In our study, the data indicated that the majority of the athletes involved in the AR belongs to A social class, being characterized, hence as a privileged group from the educational, socio-economical and dietetic view point. Nonetheless, despite this reality, the athletes are exposed to several adverse conditions, suggesting that there is an intrinsic motivation that encourages them to face all these conditions. Considering the physical and cognitive stress derived from this kind of sport, and the fact that athletes complete the race planning for another, it leads us to question about the incidence or not of the exercise dependence.

The average scores observed in the EDS for both genders suggest the existence of exercise dependence. These indices were similar to the ones observed by Rosa *et al.* (2003)[11] who investigated Brazilian marathon runners, who were similar to the ones from the study by Hailey and Bailey as well[10].

Significant differences were not observed when the EDS scores between the male and female sample were compared, suggesting hence, that there are not differences concerning the dependence development in this sport between genders. Such datum corroborates the findings by Furst and Germole (1993)[21] and Rosa *et al.* (2003)[11] who did not find differences in the EDS when men and women were compared either. On the other hand, the studies by Crossman *et al.* (1987)[22] ad Pierce *et al.* (1997)[23] revealed that differences between genders may occur once there are reports showing that men present stronger feelings of discomfort when interrupt their training programs comparing to women, and that higher scores in the EDS are found in women particularly when the physical training volume is paired.

The association between behavioral disturbs and exercise dependence is frequent, once the dependent subjects may present high scores for anxiety, psychological alterations, such as mood disturbs, and sometimes anorexia nervosa[19,24-25]. In our study, the IDATE application (trace and state) demonstrated an average score related to the moderate anxiety classification. This result seems to little influence in the life quality of these subjects, once the total score of the SF-36, when all the dimensions are evaluated, are above 85%, being this percentage an indication of a good life quality It is possible that the anxiety level presented by the athletes was insufficient in order to interfere in their life quality, once the POMS results showed a profile known as *iceberg* in which the vigor dimension was more evident than in the other dimensions, suggesting that there is not significant presence of mood disturbs.

In our sample, the fact that there is not exercise dependence and that this dependence does not seem to be necessarily associated with a mood disturb, leads us to a questioning on which factors could be related with this disparity, once the literature reports the concomitance between the exercise dependence and mood disturbs[25-26]. Nevertheless, a probable hypothesis could be that the environmental aspect where the sport is practiced has a considerable influence, since the AR athletes train and compete in places with large environmental diversity having contact with Nature. Moreover, they are exposed to new experiences, motivation and always compete in teams, which is a high motivation factor. These factors as a whole could decrease the aspects concerning the mood disturb. A point to be considered is the fact that AR is a multisport, which would avoid for instance, the monotony observed in other sports such as the marathon. Another important issue refers to possible neurochemical alterations triggered by physical exercise. Exercising increases the release of ß-endorphin; such release is associated with analgesia, with antidepressive effects caused by physical exercise and particularly with the neurotransmission dopamine release[27-28]. Such neurotransmission is related with the activation of brain areas responsible for pleasure and satisfaction, perhaps this is the mechanism through which athletes who present scores for physical exercise dependence present low scores for mood disturbs.

CONCLUSION

Our data demonstrate that adventure race athletes present scores that point to exercise dependence. However, these scores do not seem to be related to scores that point to mood disturbs, once no significant alteration was observed in the life quality of these athletes. Moreover, environmental and neurochemical aspects may be involved with this result.

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